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324. Proposed by R. D. CARMICHAEL, Princeton University.

Sum the *finite* series  
 $\frac{16n^2 - 2^2}{4!} - \frac{(16n^2 - 2^2)(16n^2 - 4^2)}{6!} + \frac{(16n^2 - 2^2)(16n^2 - 4^2)(16n^2 - 6^2)}{8!} - \dots$   
where  $n$  is a positive integer.

Solution by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

$$\cos m\theta = 1 - \frac{m^2}{2!} \sin^2 \theta + \frac{m^2(m^2 - 2^2)}{4!} \sin^4 \theta - \frac{m^2(m^2 - 2^2)(m^2 - 4^2)}{6!} \sin^6 \theta + \dots$$

Let  $m=4n$ , then

$$\begin{aligned} \cos 4n\theta &= 1 - \frac{16n^2}{2!} \sin^2 \theta + \frac{16n^2(16n^2 - 2^2)}{4!} \sin^4 \theta \\ &\quad - \frac{16n^2(16n^2 - 2^2)(16n^2 - 4^2)}{6!} \sin^6 \theta + \dots \end{aligned}$$

Let  $\theta = \frac{1}{2}\pi$ , then  $\cos 4n\theta = \cos 2n\pi = 1$ .

$$\begin{aligned} \therefore 1 &= 1 - \frac{16n^2}{2!} + \frac{16n^2(16n^2 - 2^2)}{4!} - \frac{16n^2(16n^2 - 2^2)(16n^2 - 4^2)}{6!} \\ &\quad + \frac{16n^2(16n^2 - 2^2)(16n^2 - 4^2)(16n^2 - 6^2)}{8!} - \dots \\ \therefore \frac{1}{2} &= \frac{(16n^2 - 2^2)}{4!} - \frac{(16n^2 - 2^2)(16n^2 - 4^2)}{6!} \\ &\quad + \frac{(16n^2 - 2^2)(16n^2 - 4^2)(16n^2 - 6^2)}{8!} + \dots \end{aligned}$$

## GEOMETRY.

345. Proposed by LLOYD HOLSINGER, Bradley Polytechnic Institute, Peoria, Ill.

If a variable polygon move in such a way that its  $n$  sides turn severally round  $n$  fixed points  $O_1, O_2, \dots, O_n$  while  $n-1$  of its vertices slide, respectively, along  $n-1$  fixed straight lines  $v_1, v_2, \dots, v_{n-1}$ , then the last vertex will describe a conic; and the locus of the point of intersection of any pair of non-adjacent sides will also be a conic. Cremona's *Projective Geometry*.